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EXAMINER	
MCCRACKEN, DANIEL	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/719,000	GODDARD ET AL.	
	Examiner	Art Unit	
	Daniel C. McCracken	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☒ Claim(s) *7, 9-10, 12, 28, 30-31, 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format (S. #, ¶) where # denotes the page number and ¶ denotes the paragraph number. Citation to patent literature will be in the form (Inventor #, LL) where # is the column number and LL is the line number.

Information Disclosure Statement

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicants have done little more than run a computer simulation. *See* (S. 13) ("Performance Simulations"). There is nothing in the Applicants' specification to suggest that Applicants have made a composition described in Claims 1-15, a hydrogen storage system as described in Claim 16, a method as described in Claims 17-35, or a method of making a hydrogen storage system as described in Claim 36. Examiner notes the lack of examples of

compositions produced as well as the lack of detail in which the method of making is described. *See generally* (S. 9, [00037] *et seq.*) ("Method of Making the Compositions," nothing that the method of making is "generally not limited to a particular procedure or series of steps," and that "a number of techniques or steps may be utilized.").

While Examiner is of the position that the reasons set forth above are sufficient to maintain the rejection under 35 U.S.C. §112, first paragraph, the following is noted for the record. Examiner's search of the prior art revealed a journal article appearing in Physical Review Letters, Vol. 92, No. 16 (published 4/21/2004) entitled "New Alkali Doped Pillared Carbon Materials Designed to Achieve Practical Reversible Hydrogen Storage for Transportation" ("the PRL article"), authored by the Applicants. The article itself, while ineligible as prior art due to its publication date, bears a striking resemblance to the Applicants specification. Examiner makes note of Figure 1 in the pending application being identical to Figure 5 of the PRL article.[1] Of interest was the discussion of each figure in the pending application and the PRL article. The application describes Fig. 1 as "an illustrative scheme to synthesize a Li-doped pillared graphene." (S. 4, [00015]). The PRL article, however states that Fig. 5 "proposes a possible scheme to synthesize a practical hydrogen-storage system," based on "belie[fs] that the same intercalation synthesis [described by others] can be extended to SWNT systems." *PRL Article* at 166103-1. The PRL Article is further treated in the rejections of Claims 1-36 for failing to comply with the enablement requirement.

Claim 1-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter that was not described in the

[1] Other figures in the PRL article are substantially identical if not exactly identical to those in Applicants' Specification.

specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The analysis for determining whether a claim is supported by the disclosure is cast in terms of whether "undue experimentation" is necessary to practice the invention. *See* MPEP 2164.01. In examining the claims in light of the supporting disclosure, the Federal Circuit has provided a non-exclusive list of factors to consider in determining whether a disclosure is enabling. *See generally In re Wands,* 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). These factors include:

a. The breadth of the claims;
b. The nature of the invention;
c. The state of the prior art;
d. The level of one of ordinary skill;
e. The level of predictability in the art;
f. The amount of direction provided by the inventor;
g. The existence of working examples; and
h. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Id. "Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." *Id.* Examiner has considered all factors in light of all claims rejected makes the following findings of fact:

a. The breadth of the claims

Applicants have submitted claims of varying scope. Claims 1 and 17 are representative of the broadest claims; claims 13 and 35 are representative of the narrowest. In general, parity between the claims and the specification exists, i.e. the language of the claims is directly repeated in the specification. *Compare e.g.* Claim 1 *with* (S. 3,[00011]) and Claim 17 *with* (S. 3, [00013]).

b. The nature of the invention

The invention is drawn to a nano-scale composition comprising "a pillared carbon material doped with a metal" and a method of making such a composition.

c. The state of the prior art and the level of one of ordinary skill

While the references submitted by Applicants have not been formally considered by Examiner due to the lack of an Information Disclosure Sheet in compliance with 37 C.F.R. 1.98, it would seem reasonable to assume that those references cited by the Examiner (some of which are the same as those provided by Applicants) as representative of the state of the prior art and the level of ordinary skill in the art. A person of ordinary skill in the art would be familiar with carbon nanostructures and their preparation. A person of ordinary skill in the art would not be familiar with theoretical computer modeling, which is necessary to understand the specification and claims.

d. The level of predictability in the art

Examiner recognizes that significant advances in nanotechnology have been made in recent years, but the art still exhibits some degree of unpredictability owing to the fact the art deals with things on an atomic scale where electron densities are expressed in probabilities. This principle is well known. *See* Theodore L. Brown, H. Eugene LeMay, Jr. & Bruce E. Bursten, *Chemistry The Central Science* 195-196 (7th ed., Prentice Hall 1997) (discussing Heisenberg's uncertainty principle).

Applicants, while using what is surely the most sophisticated computer simulation and modeling software, are still making assumptions of the physical world that were not verified by experimental results. *See generally* (S. 18-19, n. 12-13, 18).

e. The amount of direction provided by the inventor

Applicants have provided little direction as to how to make the claimed invention. There is a discussion related to making the composition, *see* (S. 9), but the discussion is

lacking in terms of technical guidance. Applicants come close in their discussion beginning on p. 11, ¶[00045].

The critical step in Applicants' process, namely adding the metal to the carbon nanostructures to produce a "pillared carbon material" is described in one sentence. *See* (S. 11,[00045]) ("As shown in this figure, (1) ternary compounds are first produced by the reaction between host carbons and solvated alkali cations, e.g. 2,5-dihydrofuran solvated Li cations, in *low concentration* such that the interlayer spaces of the graphite are expanded.") (emphasis added). Applicants have provided no guidance as to what concentration is needed. With the seemingly endless permutations that Applicants have claimed - e.g. a carbon material selected from graphite, graphene, carbon nanostructures (including nanofibers, naoncells, nanobarrels, multi-wall nanotubes, single-wall nanotubes and combinations thereof) as in Claims 4-5 and metals selected from alkali and alkaline earth metals as in claim 2, little to no guidance is provided as to how to combine the two.

f. The existence of working examples

Applicants have provided *no* working examples of their claimed invention. As mentioned before, Applicants have only run a computer simulation. (S. 13, [00049]).

g. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Applicants "Performance Simulation" discussion provides a tacit admission that a great deal of experimentation would be necessary. See e.g. (S. at 19, n. 13) (noting that some 1,000,000 configurations were used to compute the average loading for each condition). Further, Applicants "Performance Simulation" makes assumptions that are either physically impossible or would be highly difficult to synthesize in practice. For example, Applicants consider "an infinite crystal with no surfaces," (S. at 25, [00055]),

and a "finite three-dimensionally periodic cell containing four independent sheets each with 216 carbon atoms." (S. at 19, n. 13). Applicants claims, *see e.g.* Claims 29-35, are based on a physical reality that cannot exist.

The Examiner makes note of the "PRL Article" discussed above in support of the enablement rejections.[2] While the PRL Article and the Applicants specification bear an uncanny resemblance to one another, several key differences are noted: (1) Applicants merely "suggest ways to synthesize" the claimed system in the PRL Article. *See* PRL Article at 166103-1 (Abstract). (2) The discussion on page 166103-3 of the PRL article, beginning on the bottom of the first column, repeated here in its entirety:

> ***There is also experimental evidence that the ILD of GIC can be expanded.*** It was proved that either type organic ligands can bind to alkali metal ions and cointercalate into the host carbons so that the interlayer distance of GIC can be expanded from around 3:4 _A to 8:7–12:4 _A [20]. ***We believe that the same cointercalation synthesis method can be extended to SWNT systems to expand the intertube distances.*** Figure 5 proposes ***a possible scheme*** to synthesize a practical hydrogen-storage system such as the following:
>
> (i) Ternary compounds are first produced by the reaction between host carbons and 2,5-dihydrofuran solvated Li cation in low concentration such that the interlayer spaces of graphite are expanded. (ii) A Diels-Alder–type reaction between the organic solvents and the graphite sheets is triggered to build covalent bonds that would maintain the interlayer space under operating conditions. (iii) Li-intercalation and proper ball milling are used to synthesize PGS of higher Li concentration.
>
> ***We have tested this process with computer simulations.*** For Li:C _ 1:3, we considered one pillar per 116 carbons and find ILD _ 8:0 _A. Carrying out GCMC calculations on this system we find 5.7 mass% hydrogen storage at 300 K and 50 bars. For maximum performance the pillar should be modified to yield ILD _ 10 _A.
>
> Summarizing, we have designed a series of new materials for H_2 storage: Li-PGS and Li-P-SWNT. We have tested and optimized the nanostructure of these Li-doped carbon materials using grand canonical Monte Carlo simulations with a first principles-derived force field.

[2] Post-filing date references may be used to support enablement rejections. *See In re Hogan*, 559 F.2d 595, 605, 194 USPQ 527, 537 (CCPA 1977).

> ***We predict*** that for 1:3 Li:C doping and ILD _ 10 _A, Li-PGS will lead to hydrogen storage of 6.5 mass% and 62:9 kg=m3 at 20 bars and room temperature, attaining the DOE target. We find that Li-P-SWNT (1:3 Li:C doping and ITD _ 9 _A), can lead to a hydrogen-storage capacity of 6.0 mass% and 61:7 kg=m3 at 50 bars and room temperature storage, which is close to the DOE target. ***We also suggest*** ways to synthesize these systems by cointercalation of solvated Li ion followed by Li-intercalation and ball milling.

PRL Article at 166103-3 – 166103-4 (emphasis added). In addition to showing that Applicants did not possess the claimed invention at the time of filing, the PRL Article shows that at least 5 months after filing the non-provisional and 17 months after the provisional application was filed, Applicants had not described the invention in such a way that as to not enable one of ordinary skill in the art to make and use the invention. All that was known at the time of the filing date, and indeed 5 months later, was that a computer simulation with human inputted coefficients, assumptions about physical reality, etc. suggested that the claimed composition was possible.

Claim Construction

In general, claims are given their broadest reasonable construction in light of the specification. See generally MPEP 2111. It is the settled rule, however, that the applicants can be their own lexicographer. Applicants have chosen to define many terms. *See* (S. 5) ("Definitions and Nomenclature").

At issue is what meaning to attach to "pillared." Applicants have defined "pillared" to "refer[] to an alteration in a carbon material in which parts of the carbon material are separated from each other . . . by the pillar." (S. at 7, [00028]). The rest of Applicants' discussion of "pillared" fails to provide Examiner with much guidance as to what pillared means. While Applicants attempt to distinguish a "pillared" material from a "doped" material on the basis of stability, no authority is provided to support that proposition. Thus, a broad interpretation could

include metals added to a carbon material in that the metal atoms could separate the carbon material and provide space for other metal atoms and hydrogen.

Examiner makes note of Claim 17 as relevant as to the meaning of "pillared." The third limitation recites "carrying out a reaction between the organic ligands and the carbon material *to form a pillared carbon material.*" (S. 23) (emphasis added). In construing claim terms, the Federal Circuit has stated, "[t]he context in which a claim term is used . . . can be highly instructive." *Phillips v. AWH Corp.* 415 F.3d 1303, 1314 (Fed. Cir. 2005). However, as the Federal Circuit also pointed out, the claims are part of "a fully integrated written instrument" in recognizing the important role the specification plays. *Id.* at 1315 (citations omitted). In light of these teachings, the examiner adopts the following construction for "pillared:" A "pillared" carbon material refers to the alteration of a carbon material in which parts of the carbon material are separated from each other by solvated alkali metal containing organic ligands. This construction comports with Claim 17 as well as the specification. *See e.g.* (S. "Fig. 1") (showing the intercalation of an organic ligand); (S. 10, [00038]) ("carring out a reaction between the organic ligand and the carbon material to form a pillared carbon material"); (S. 10, [00041]) ("The reaction between the organic ligand and the carbon material may be any suitable reaction useful to form a pillared carbon material.").

Claim Objections

Claims 7, 9-10, 12, 28, 30-31, and 33 are objected to for depending upon a claim that has been rejected.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

As to the first *Graham v. John Deere Co.* inquiry, determining the scope and contents of the prior art, Examiner makes the following findings of fact: Carbon nanostructures have been known to be suitable for hydrogen storage for some time. *See generally* Chambers, et al., *Hydrogen Storage in Graphite Nanofibers*, J. Phys. Chem. B, Vol. 102, No. 22 (May 28, 1998); US 5,653,951 to Rodriguez, et al.; Chen, et al., *High H_2 Uptake by Alkali-Doped Carbon Nanotubes Under Ambient Pressure and Moderate Temperature*, 285 Science 91 (July 2, 1999); and US 6,471,936 to Chen, et al. Under the broad umbrella of carbon nanostructures, several

shapes/geometries have been identified: carbon nanotubes, nanofibrils, and nanoshells, (Rodriguez '951 4, 3-12), in any number of shapes or configurations. (Rodriguez '951 5, 42-53) (describing the range of shapes nanofibers can take on). These nanostructures are preferably layered, having interstices that will store hydrogen. (Rodriguez '951 3, 35 *et seq.*). Different techniques may be utilized to alter the shape, (Rodriguez '951 5, 54, et seq.) (discussing controlling the structural form of nanofibers), and in turn alter the interstices (Rodriguez '951 3, 36 *et seq.*) (discussing the affect of an ordered nanostructure on gas adsorption). Thus, there is a motivation to alter the interstices of layered carbon nanostructures so as to increase the ordered structure and in turn gas adsorption capabilities of the nanostructure.

The addition of metals has been found increase the activity of carbon nanostructures, that is the addition of metals can increase the adsorption of hydrogen. (Rodriguez '951 8, 40-49). *See also* Chen, 285 Science at 91 (discussing alkali-metal doping of carbon nanotubes).

Claims 1, 4-6, 11, 13-18, 21-25, 27, 32 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,653,951 to Rodriguez in view of Inagaki, et al., *Determining factors for the intercalation into carbon materials from organic solutions*, 39 Carbon 1083 (2001).

Claim 1 is drawn to a carbon-based composition comprising a pillared carbon material, doped with a metal. Claim 15 recites a hydrogen storage method comprising the composition according to Claim 1. Claims 16 and 36 are drafted in *Jepson* format while reciting the limitations of Claim 1. Rodriguez '951 describes layered carbon composition (Rodriguez '951 2, 48-51), that can be doped with a metal. (Rodriguez '951 8, 40-49). Rodriguez '951 does not disclose a pillared material, as defined in the Claim Construction section. Inagaki describes the intercalation of carbon materials with an organic ligand. (Inagaki 1084). The composition of Rodriguez '951 would be modified by performing the intercalation reaction described by

Inagaki. As discussed above in ascertaining the scope and contents of the prior art, one would be motivated to make this combination due to the ability to alter the interstices in the layered carbon material so as to affect the materials ability to store gas. *See e.g.* (Rodriguez 3, 35 *et seq.*) (discussing the affect of interstices and crystallinity on gas storage) *and* Inagaki, 39 Carbon at 1086 (discussing the affect that different metal ions have on spacing between carbon layers). This discussion of the rejection of Claim 1, including the motivation to combine the references, is incorporated by reference herein to all claims depending on Claim 1.

Claims 4 depends on Claim 1 while reciting the additional limitation of the carbon composition comprising graphite, graphene, carbon nanostructures and combinations thereof. Claim 5 further limits Claim 4 to describe several carbon nanostructures. Rodriguez describes graphite, (Rodriguez at 3, 48), and a multitude of carbon nanostructures. (Rodriguez 4, 3-12). Inagaki describes "[c]arbon materials with high orientation degree of hexagonal carbon layers," etc. (Inagaki 1084).

As to Claim 6, Rodriguez '951 discloses an additive. (Rodriguez 8, 40-49). As to Claim 11, Rodriguez '951 discloses an interlayer distance of 0.67 nanometers, equivalent to 6.7 angstroms. (Rodriguez '951 3, 27). Similarly, Claim 32 (drawn to a method) recites the identical range as Claim 11. Rodriguez '951 is so applied.

Claims 13-14 recite limitations that describe intended uses of the compositions. An intended use of an old composition does not render a composition claim patentable. *See generally In re Schreiber,* 128 F.3d 1473, 1477-78, 44 U.S.P.Q. 2d 1431-32 (Fed. Cir. 1997) (citing *In re Pearson*, 494 F.2d 1399, 1403, 181 U.S.P.Q. 641, 644 (CCPA 1974)).

Claim 17 is drawn to a method of making a carbon-based composition comprising the steps of provising a solvated alkali metal containing organic ligands, combining the carbon material with the ligands, forming a "pillared" carbon material, and doping the material with a metal. Rodriguez '951describes preparing a carbon composition that is doped with a metal.

Rodriguez '951 does not disclose the claimed process. Inagaki describes providing a solvated alkali metal containing organic ligands, combining it with a carbon material and forming a "pillared" carbon material. *See generally* Inagaki, 39 Carbon at 1084 ("2. Intercalation reaction"). The motivation for combining the references as set forth in the rejection of Claim 1 is relied upon in support of the rejection of Claim 17.

As to Claim 18, Inagaki discloses Li, Na and K. *Id.* As to Claim 21-22, the discussion of the rejection of Claim 4 is relied upon. As to Claim 23, Inagaki teaches a number of heterocyclic solvents. Inagaki, 39 Carbon at 1084. As to Claim 24, Inagaki teaches unidentate and bidentate ethers as solvents. *Id.* As to Claim 25, 2,5-dihydrofuran is not explicitly taught, but reasonably suggested by Inagaki's teaching of unidentate and bidentate ethers. *Id.* As to Claim 27, Rodriguez '951 discloses an impurity. (Rodriguez '951 8, 40-49). As to Claim 35, Rodriguez '951 discloses an interlayer distance of 0.67 nanometers, equivalent to 6.7 angstroms. (Rodriguez '951 3, 27).

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,653,951 to Rodriguez in view of Inagaki, et al., *Determining factors for the intercalation into carbon materials from organic solutions*, 39 Carbon 1083 (2001) and in further view of Janot, et al., *Ball Milling: a new route for the synthesis of superdense lithium GICs*, 39 Carbon 1931 (2001).

Claim 26 depends on Claim 17 while reciting the additional limitation of the doping including intercalation of the metal and ball milling of the pillared material. Rodriguez does not disclose ball milling. Janot describes ball milling to intercalate lithium into graphite. One would be motivated to combine the ball milling technique of Janot to dope a metal as taught by Rodriguez because the technique results in "a well-crystallized compound." Janot, 39 Carbon at 1931. *See also* (Rodriguez at 3, 35 *et seq.*) (discussing the importance of crystallinity).

Claims 2-3, 8, 19-20, 29, and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,653,951 to Rodriguez in view of Ingaki, et al., *Determining factors for the intercalation into carbon materials from organic solutions*, 39 Carbon 1083 (2001), in further view of Chen, et al, *High H_2 Uptake by Alkali-Doped Carbon Nanotubes Under Ambient Pressure and Moderate Temperatures*, 285 Science 91 (1999).

Claims 2 and 3 depend on Claim 1 while reciting the additional limitation of the metal being selected from alkali metals, alkaline-earth metals, and combinations thereof. Claim 3 recites the alkali and alkaline earth metals. Rodriguez '951 describes alkaline earth metals. (Rodriguez '951 at 8, 48) (disclosing Mg, an alkaline earth metal). While Rodriguez does discuss the use of alkali and alkaline earth metal catalyst, (Rodriguez '951 5, 50-53), it does not explicitly disclose the doping with an alkali metal. Chen discloses doping carbon nanostructures with alkali metals. Chen, 285 Science at 91. One would be motivated to combine Chen with Rodriguez in view of Inagaki because of the "high hydrogen-uptake capacity" shown in the layered carbon structure. *Id.* Similarly, Claims 19-20 (drawn to a method) recite the same doping metals. The preceding discussion is relied upon in support of the rejection of Claims 19-20.

Claim 8 depends on Claim 1 while reciting the additional limitation of the ratio of metal to carbon atoms is approx 1:3 to 1:24. Chen discloses a ratio of 1:15. Chen, 285 Science at 91. Similarly, Claim 29 (drawn to a method) recites an identical range. Chen is so applied.

Claims 34-35 recite limitations that describe intended uses of the compositions. An intended use of an old composition does not render a composition claim patentable. *See generally In re Schreiber,* 128 F.3d 1473, 1477-78, 44 U.S.P.Q. 2d 1431-32 (Fed. Cir. 1997) (citing *In re Pearson*, 494 F.2d 1399, 1403, 181 U.S.P.Q. 641, 644 (CCPA 1974)).

Conclusion

Applicants have not described the invention in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Further, the invention was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Applicants' own journal article[3] provides evidence that Applicants did not in fact invent a composition or method of making the same. Further, the journal article shows that after the filing date, the state of the art was such that the claimed invention had not been practiced with any success.

The Applicants' claimed process is a compilation of old and known techniques described in publications that provide motivation to combine the teachings, rendering the claims obvious over the prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel C. McCracken whose telephone number is (571) 272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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[3] Deng, et al., *New Alkali Doped Pillared Carbon Materials Designed to Achieve Practical Reversible Hydrogen Storage for Transportation*, 92 Physical Review Letters 16, pp. 166103-1 to 166103-4 (2004)

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel C. McCracken

DCM

STUART L. HENDRICKSON
PRIMARY EXAMINER